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An assessment of the guava fruit squash's quality in combination with papaya and herbs

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Abstract

The present research entitled "Quality evaluation of guava fruit squash blending with papaya and medicinal herbs" was carried out during 2029-20 at Post Post Harvest Management Lab Department of Horticulture College of Agriculture, Gwalior, (M.P.). The experiment was laid in a Factorial Randomized Design, composed of eighteen treatments combination and three. Among the different treatments papaya local white fleshed guava variety + 50% + guava 50% + lemon grass recorded the maximum organoleptic score *i.e.,* flavour, taste, texture and overall acceptability and with preferable TSS, ascorbic acid, reducing sugars and total sugars respectively. Among the different squash blends papaya 50% + guava 50% had attained the best quality and organoleptic score and it was selected as the best treatment.

Keywords: Papaya, guava, squash, TSS, ascorbic acid, total sugars, texture

Introduction

India is one of the major guava producing country in the world. Guava is cultivated on 265 thousand hectare area with an estimated average production of 4054 thousand MT in India and 35.08 thousand hectare area with 686.7 thousand MT production in M.P. It is widely naturalized in the country and is often considered as a super fruit due to its rich nutritional value. The fruit has about 83% moisture. It is an excellent source of ascorbic acid (100-260 mg/100 g) and pectin (0.5-1.8%). It also contains calcium (14-30 mg/100 g), Phosphorus (23-37 mg/100 g), iron (0.6-1.4 mg/100 g) as well as vitamins like niacin, pantothenic acid, thiamine, riboflavin and vitamin A.

Papaya is regarded as wonder fruit of the tropics and subtropics. It is cultivated on 138 thousand hectare area with an estimated average production of 5989 thousand MT in India and 10.55 thousand hectare area with 421.55 thousand MT production in M.P. It is an excellent source of vitamin A (2020 IU/100 g) and also rich source of other vitamins like thiamine, riboflavin, nicotinic acid. The processes are available for making squash and cheese from mango, banana, papaya, guava, and pineapple. However, not much published information is available for making mixed fruit cheese and squash with guava, but if papaya used in combination with guava can give super quality products.

The post-harvest losses of fruits in India are estimated at 5-30% of total production. Guava and papaya have 15.88% and 6.70% post-harvest losses respectively. Processing of fruit minimizes these losses to some extent and gives better returns to the farmers during glut season. Freshly harvested, ripe fruit naturally can remain in good condition only for few days. These fruits can be converted to commercial food commodities like pulp, juices, jam, jelly, nector etc. via mechanical crushing, sedimentation and filtration or enzyme assisted clarification. Guava is not only a delicious and nutritious fruit but may also be utilized to make products like jam, jelly, cheese, bar, juice, canned segments, squash, nector, RTS ,dehydrated slice, flakes, toffee, sauce, guava lather, baby food puree etc. Fruit cheese and fruit squash has recently become very popular. Guava cheese is confectionary, tasty, nutritious, chewy and relished products by all categories of people, particularly very popular among children.

Medicinal herbs are actually a boon to mankind. They are not only used solely to cure any disease but their food additive quality. Incorporation of medicinal plants in processed food products started way back but guava squash supplemented with quality of medicinal plants are yet to be harnessed. In the study ginger, cardamom, lemon grassare used solely or in combination in the guava squash so as to ensure the presence of their benefits solely or in combination.

Ginger is very useful in treating chronic inflammation and also effective against osteoarthritis, rheumatism, and cancer. It is used in two forms dried and flesh. Lemongrass is used for treating digestive tract spasms, stomach ache, high blood pressure, pain, vomiting, cough, fever, cold, and exhaustion. Cardamom have antioxidant and diuretic properties. It also help in digestive problems, ulcers, bad breath and cavity.

Materials and Methods

The experiment was conducted from 2019-20 at the

Department of Horticulture, College of Agriculture, RVSKVV, Gwalior M.P.'s post-harvest and processing laboratory. For this investigation, completely ripe fresh guava fruits were gathered from the College of Agriculture's orchard, RVSKVV Gwalior (M. P.), and papaya fruits from the nearby market. Guava and papaya pulp, sugar, and citric acid were used to make guava-papaya squash. 18 treatment combinations were used in the experiment: two levels of variety (V1: local white fleshed guava variety, V2: local red fleshed guava variety), three levels of guava and papaya pulp (S1: 100% guava, S2: 75% guava + 25% Papaya, and S3: 50% guava + 50% Papaya), and three levels of medicinal herbs (M1: cardamom, M2: ginger and M3: lemon grass). The several guava-papaya squash preparation methods were set up in a factorial totally randomized design with three replications, and the recorded data were then examined in light of this arrangement. A 30 day interval was used to investigate the organoleptic properties of a mixed squash sample containing guava and papaya that had been kept between 0 and 120 days.

Method/Procedure of pulp preparation

Selection of fruit

The fully matured healthy fruits were selected for this purpose. As indicated earlier.

Preparation of fruits for pulping

The fruits were washed in running tap water for removing the adhering dirt after washing of fruits, preliminary trial was conducted to standardize the method of extraction of pulp. The pulp was extracted using the following procedure.

Extraction of pulp from fruit

The fruits were cut into small pieces with the help of stainless steel knife, then the Small pieces of guava mixed with some quantity of water and steamed for pulp preparation. The steamed pulp was prepared with the help of mixer cum grinder and the seeds were strained with stainless steel sieve.

Recipes method of guava squash

Washed guava fruits (mixed treatments wise) were sliced into small pieces (2-2.5 cm) with stainless steel knife while immersed in water. Fruit slices in water were heated at 74 - 75 ^{o}C for (2 - 5 min). Small pieces were mashed in a grinder with filtered water in proportions of 1: 3 by weight (guava slices / water, w/v). Pulp thus obtained was passed through a muslin cloth. The guava squash treatments were heated to 85 ^{0}C. For the final product, preservative KMS (Potassium metabisulphite) 350 ppm was added to prevent spoilage during the storage. The prepared squash was poured into pre-sterilized bottles of 200 ML capacity (sterilized at 25 lb/inch for 15 min) and sealed airtight. Then the product was sterilized in boiling water for 20 minutes and cooled immediately.

Results and Discussion

Total soluble solids (°Brix)

The data recorded on Total soluble solids (^{o}Brix) of papaya blended squash was presented in Table 1. There were significant differences observed on TSS of guava-papaya blended squash in different combinations. However, the highest TSS (43.05, 42.85, 42.65, 42.35 and 42.05 ^{0}Brix) was reported in local white fleshed guava variety + papaya 50% + guava 50% + lemon grass (V1S3M3). Whereas the lowest TSS (37.62, 37.42 37.22, 36.92 and 36.77 ^{0}Brix) was recorded in local white fleshed guava variety + guava 100% + cardamom (V2S1M1). The variation in TSS might be due to various concentration and combination of guava, and papaya pulps added with papaya pulp. Similar findings were also reported by Awsi Jan and Dorcus Masih (2012) [9] in pineapple, carrot and orange blend juices were reported. Shaheel *et al*. (2015) [2] reported in karonda juice blended with guava, papaya, and pineapple juices.

Total sugars (%)

The data recorded on Total sugars (%) of papaya blended squash was presented in Table 1. Among the different treatments the highest total sugars (43.70, 44.45, 45.16, 45.69 and 46.03%) was recorded in local white fleshed guava variety + papaya 50% + guava 50% + lemon grass (V1S3M3). Whereas the lowest total sugars (38.78, 39.37, 39.99, 40.39 and 40.69%) was recorded in local red fleshed guava variety + guava 100% + cardamom (V2S1M1). There was a variation in total sugars of papaya blended squash and this might be due to addition guava in different proportions. Similarly, by Bharadwaj and Mukherjee (2011) [2] in kinnow, aonla and ginger blended juices.

Reducing sugars (%)

The data recorded on Reducing sugars (%) of papaya blended squash was presented in Table 2. Among all the treatments the highest reducing sugars (17.17, 18.08, 19.19, 20.06 and 20.82%) was recorded in local white fleshed guava variety + papaya 50% + guava 50% + lemon grass (V1S3M3). Whereas the lowest reducing sugars (14.32, 15.10, 16.08, 16.80 and 17.42%) was recorded in local red fleshed guava variety + (guava 75% + 25% papaya) + ginger (V2S2M2). This variation in reducing sugars might be due to variation in concentration of papaya blended with guava pulp having highest TSS Similar findings were also reported by Sakhale (2012) [5] in mango-whey and Gowri *et al*. (2015) [4] in papaya and carrot (50:50) blended squash.

Ascorbic acid (mg/100 g)

The data recorded on Ascorbic acid (mg/100 g) of papaya blended squash was presented in Table 2. There was significant difference among the treatment combinations on ascorbic acid content of guava-papaya blended squash. Among the different treatments the highest ascorbic acid content (33.89, 32.03, 36.10, 29.11 and 28.08 mg/100 g) was recorded in local white fleshed guava variety + (guava 75% + papaya 25%) + lemon grass (V1S2M1). Whereas the lowest ascorbic acid content (17.36, 16.40, 18.49, 14.91 and 14.30 mg/100 g) was recorded in local red fleshed guava variety +guava 100% + lemon grass (V2S1M3). This might be due to higher ascorbic acid content of pineapple. Similar findings were also reported by Gowri *et al*., (2015) [4] in papaya and carrot (50:50) blended squash and also by Deka (2000) in mango-pineapple, lime-aonla and guava-mango blends.

Taste

Among the different treatments the highest taste (8.51, 8.11, 7.55, 7.03 and 5.60) was recorded in local white fleshed guava + (guava 75% + papaya 25%) + ginger (V1S2M2). Whereas the lowest taste (6.48, 6.17, 5.75, 3.35 and 4.26) was recorded in local red fleshed guava + guava 50% + papaya 50% + lemon grass (V2S3M3).

Overall acceptability

Among the different treatments the highest overall acceptability (8.07, 7.75, 7.44, 6.55 and 5.05) was recorded in local white fleshed guava variety + (guava 75% + papaya 25%) + lemon grass (V1S2M1). Whereas the lowest overall acceptability (6.02, 5.78, 5.55, 4.89 and 3.77) was recorded in local red fleshed guava variety + guava 75% + 25% papaya + lemon grass (V2S2M1). Among the different blended squashes, the combination of papaya and papaya (50:50) showed best in physicochemical properties and organoleptic evaluation. Hence the same treatment *viz*., papaya 50% + papaya 50% was selected for blending with spices and evaluation for storage stability for a period of 4 months at ambient storage conditions. These results are similar with findings of Awsi Jan and Dorcus Masih (2012) [9] in pineapple, carrort and orange juice blends. Sindumathi *et al*., (2017) [7] also reported the ratio of 50:50 was reached the highest sensory scores for overall acceptability of naturally flavoured mango and papaya blended beverage. Gowri *et al*. (2015) [4] also reported in papaya and carrot (50:50) blended squash which had the highest organoleptic score (7.90).

Texture

Among the different treatments the highest texture (8.66, 7.97, 7.15, 6.20 and 5.06) was recorded in local white fleshed guava variety + guava 100% + cardamom (V1S1M1). Whereas the lowest texture (6.65, 6.12, 5.49, 4.76 and 3.88) was recorded in local white fleshed guava variety + guava 75% + 25% papaya + cardamom (V1S2M1). It was reported that a gradual decrease in texture score in 120 days of storage study (Chavan and Shaikh. 2015) [8].

Flavour

The data indicate that flavour values decrease the highest flavour (88.42, 8.04, 7.64, 7.08 and 5.85) was recorded in local white fleshed guava variety + guava 100% + ginger (V1S1M2). Whereas the lowest texture (6.21, 2.92, 5.63, 5.22 and 4.31) was recorded in local white fleshed guava variety + guava 75% + 25% papaya + lemon grass (V1S2M1). The loss of flavour was reported in guava fruit leather (Chavan and Shaikh. 2015) [8].

Table 1: Biochemical quality of fruit squash up to 120 days of storage

Treatment combination	TSS (°Brix)					Total sugar (%)				
	0 DAS	30 DAS	60 DAS	90 DAS	120 DAS	0 DAS	30 DAS	60 DAS	90 DAS	120 DAS
V1S1M1	40.78	40.58	40.38	40.18	39.88	39.81	40.07	40.79	41.17	41.46
V1S1M2	41.23	41.00	40.80	40.50	40.23	42.35	42.97	43.73	44.23	44.52
V1S1M3	42.53	42.33	42.13	41.87	41.57	42.38	43.09	43.96	44.43	44.79
V1S2M1	37.55	37.35	37.15	36.85	36.60	38.92	39.44	40.11	40.47	40.80
V1S2M2	40.20	40.00	39.80	39.60	39.35	40.96	41.70	42.32	42.68	43.02
V1S2M3	41.77	41.57	41.37	41.17	40.87	42.54	43.40	44.07	44.54	44.91
V1S3M1	40.98	40.78	40.58	40.28	39.98	40.25	40.84	41.38	42.09	42.39
V1S3M2	41.70	41.50	41.30	41.00	40.80	42.71	43.14	43.72	44.22	44.50
V1S3M3	43.05	42.85	42.65	42.35	42.05	43.70	44.45	45.16	45.69	46.03
V2S1M1	37.62	37.42	37.22	36.92	36.77	38.78	39.37	39.99	40.39	40.68
V2S1M2	40.52	40.32	40.12	39.83	39.53	40.04	40.76	41.34	41.73	42.05
V2S1M3	41.13	40.92	40.72	40.42	40.13	41.57	42.18	42.91	43.30	43.62
V2S2M1	39.27	39.07	38.87	38.57	38.27	38.89	39.39	40.03	40.40	40.70
V2S2M2	40.07	39.87	39.67	39.47	39.22	39.69	40.34	40.96	41.38	41.52
V2S2M3	41.38	41.17	40.97	40.72	40.47	42.42	43.18	43.95	44.45	44.75
V2S3M1	40.43	40.23	40.03	39.82	39.52	41.53	42.06	42.66	43.06	43.30
V2S3M2	41.48	41.25	41.05	40.80	40.50	42.41	43.02	43.77	44.21	44.55
V2S3M3	42.45	42.25	42.05	41.82	41.52	43.27	44.08	44.62	45.14	45.43
S.Em±	0.167	0.168	0.168	0.168	0.168	0.230	0.231	0.239	0.252	0.260
CD at 5%	0.470	0.470	0.470	0.470	0.470	0.643	0.646	0.671	0.706	0.729

Table 2: Biochemical quality of fruit squash after up to 120 days of storage

Treatment combination	Reducing sugar (%)					Ascorbic acid (mg/100 gm)				
	0 DAS	30 DAS	60 DAS	90 DAS	120 DAS	0 DAS	30 DAS	60 DAS	90 DAS	120 DAS
V1S1M1	14.83	15.77	16.82	17.59	18.25	32.71	30.90	34.83	28.08	27.08
V1S1M2	16.02	16.80	17.92	18.74	19.44	26.70	25.23	28.44	22.93	22.12
V1S1M3	16.84	17.74	18.93	19.79	20.53	20.62	19.48	21.96	17.71	17.08
V1S2M1	14.51	15.28	16.27	17.02	17.66	33.89	32.03	36.10	29.11	28.08
V1S2M2	14.81	15.71	16.69	17.46	18.13	29.43	27.81	31.35	25.27	24.38
V1S2M3	16.59	17.49	18.57	19.43	20.18	22.49	21.26	23.96	19.32	18.64
V1S3M1	15.12	16.08	17.07	17.86	18.55	33.02	31.20	35.16	28.35	27.34
V1S3M2	15.89	16.62	17.65	18.46	19.17	28.44	26.88	30.29	24.42	23.56
V1S3M3	17.17	18.08	19.19	20.06	20.82	21.34	20.16	22.73	18.32	17.67
V2S1M1	14.35	15.17	16.12	16.86	17.49	27.73	26.21	29.54	23.81	22.97
V2S1M2	14.73	15.58	16.57	17.32	17.97	23.65	22.35	25.20	20.32	19.60
V2S1M3	15.91	16.73	17.84	18.64	19.32	17.36	16.40	18.49	14.91	14.38
V2S2M1	14.44	15.24	16.24	16.97	17.59	31.40	29.67	33.45	26.96	26.01
V2S2M2	14.32	15.10	16.08	16.80	17.42	25.45	24.05	27.11	21.85	21.08
V2S2M3	16.67	17.58	18.70	19.55	20.28	19.33	18.26	20.59	16.60	16.01
V2S3M1	14.64	15.48	16.48	17.24	17.89	30.42	28.74	32.40	26.12	25.20
V2S3M2	16.11	16.93	18.01	18.84	19.56	24.33	22.99	25.91	20.89	20.15
V2S3M3	16.22	17.11	18.21	19.05	19.77	31.01	29.30	33.03	26.63	25.69
S.Em±	0.222	0.219	0.239	0.251	0.260	0.577	0.545	0.616	0.501	0.491
CD at 5%	0.622	0.613	0.671	0.702	0.727	1.614	1.527	1.726	1.402	1.375

Table 3: Biochemical and sensory quality of fruit squash after up to 120 days of storage

Treatment combination	Taste					Overall acceptability				
	0 DAS	30 DAS	60 DAS	90 DAS	120 DAS	0 DAS	30 DAS	60 DAS	90 DAS	120 DAS
V1S1M1	8.50	8.10	7.54	7.02	5.59	7.72	7.41	7.12	6.26	4.82
V1S1M2	8.30	7.91	7.37	6.86	5.46	8.07	7.75	7.44	6.55	5.05
V1S1M3	8.44	8.05	7.49	6.98	5.56	7.56	7.26	6.97	6.14	4.73
V1S2M1	7.55	7.19	6.69	6.23	4.96	6.99	6.71	6.44	5.67	4.37
V1S2M2	8.51	8.11	7.55	7.03	5.60	7.54	7.24	6.96	6.12	4.72
V1S2M3	7.31	6.97	6.49	6.04	4.81	7.21	6.93	6.65	5.86	4.51
V1S3M1	7.51	7.16	6.66	6.20	4.94	7.57	7.27	6.98	6.15	4.73
V1S3M2	6.66	6.35	5.91	5.50	4.38	6.26	6.01	5.77	5.08	3.91
V1S3M3	7.73	7.37	6.86	6.39	5.09	7.84	7.52	7.23	6.36	4.90
V2S1M1	7.71	7.34	6.84	6.37	5.07	7.60	7.30	7.01	6.17	4.75
V2S1M2	7.66	7.30	6.79	6.33	5.04	7.61	7.31	7.02	6.18	4.76
V2S1M3	7.70	7.34	6.83	6.36	5.06	7.85	7.54	7.24	6.37	4.91
V2S2M1	6.60	6.29	5.85	5.45	4.34	6.02	5.78	5.55	4.89	3.77
V2S2M2	7.83	7.46	6.95	6.47	5.15	7.60	7.30	7.01	6.17	4.75
V2S2M3	7.29	6.94	6.46	6.02	4.79	7.32	7.03	6.75	5.94	4.57
V2S3M1	7.15	6.81	6.34	5.91	4.70	7.24	6.95	6.67	5.88	4.53
V2S3M2	6.48	6.18	5.75	5.36	4.27	7.09	6.81	6.54	5.76	4.43
V2S3M3	6.48	6.17	5.75	5.35	4.26	7.06	6.78	6.51	5.73	4.41
S.Em±	0.147	0.139	0.129	0.138	0.101	0.090	0.097	0.109	0.114	0.107
CD at 5%	0.413	0.389	0.362	0.321	0.284	0.252	0.271	0.304	0.320	0.299

Table 4: Sensory quality of fruit squash after up to 120 days of storage\

Treatment combination	Texture					Flavor				
	0 DAS	30 DAS	60 DAS	90 DAS	120 DAS	0 DAS	30 DAS	60 DAS	90 DAS	120 DAS
V1S1M1	8.66	7.97	7.15	6.20	5.06	8.29	7.92	7.52	6.97	5.78
V1S1M2	7.71	7.10	6.37	5.52	4.51	8.42	8.04	7.64	7.08	5.85
V1S1M3	7.57	6.97	6.25	5.41	4.42	7.99	7.62	7.24	6.71	5.56
V1S2M1	6.65	6.12	5.49	4.76	3.88	6.21	5.92	5.63	5.22	4.31
V1S2M2	8.58	7.90	7.09	6.14	5.01	7.45	7.12	6.76	6.27	5.19
V1S2M3	7.97	7.34	6.58	5.70	4.66	7.51	7.17	6.81	6.31	5.22
V1S3M1	7.70	7.09	6.36	5.51	4.50	7.84	7.49	7.11	6.59	5.46
V1S3M2	6.95	6.40	5.74	4.98	4.06	6.42	6.13	5.82	5.39	4.46
V1S3M3	7.85	7.23	6.48	5.61	4.59	7.02	6.70	6.37	5.90	4.88
V2S1M1	7.83	7.21	6.46	5.60	4.57	6.76	6.45	6.13	5.68	4.69
V2S1M2	7.87	7.25	6.50	5.63	4.60	7.30	6.97	6.62	6.14	5.08
V2S1M3	7.88	7.25	6.50	5.64	4.60	7.31	6.98	6.64	6.15	5.09
V2S2M1	6.85	6.31	5.66	4.90	4.00	5.63	5.38	5.11	4.73	3.92

V2S2M2	7.69	7.08	6.35	5.50	4.49	7.51	7.17	6.82	6.32	5.23
V2S2M3	7.79	7.18	6.44	5.58	4.55	7.21	6.89	6.54	6.06	5.02
V2S3M1	7.41	6.83	6.12	5.30	4.33	7.00	6.68	6.35	5.88	4.87
V2S3M2	6.80	6.26	5.61	4.86	3.97	6.24	5.95	5.66	5.24	4.34
V2S3M3	7.58	6.98	6.26	5.43	4.43	7.32	6.99	6.64	6.15	5.17
S.Em+ CD at 5%	0.137 0.382	0.128 0.359	0.177 0.327	0.105 0.293	0.090 0.252	0.157 0.441	0.153 0.429	0.145 0.406	0.138 0.387	0.140 0.391

Conclusion

The experimental results related to the different levels of pulp used for preparation of papaya guava fruit squash outlined that the papaya guava fruit squash prepared with different recopies was acceptable throughout the storage period of 120 days at ambient temperature. As per the chemical parameters the TSS, acidity, reducing sugars, total sugars increased with decrease in ascorbic acid content of the papaya guava fruit bar respective of the treatment. Among the different pulp levels used, the papaya guava fruit squash prepared 50% guava and 50% papaya pulp recorded appreciable. The highest score in overall acceptability observed in treatment (V1S3M3) after 120 days storage study.

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